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THE SIGNIFICANCE AND SCOPE OF NATURAL SELECTION.

Ueber Bedeutung und Tragweite des Darwin'schen Selectionsprincips. Von L. Plate, Privatdozent an der Universität Berlin. Pp. 1–153. (Leipzig: W. Engelmann, 1900.)

THE great merit of this interesting and thorough piece of work is its explicit recognition of the principle of selection as an indispensable element in organic evolution. We are in some degree prepared for the author's attitude on this question by the last sentence of his preface, in which he asserts that the principle of selection affords at the present time the only scientific explanation of the harmony existing between the endowments of an organism, whether structural or functional, and its surrounding conditions. From this statement it might be supposed that the author not only holds selection to be an essential agent in organic evolution, but that he is also prepared to dispense with the Lamarckian factors, which have certainly been appealed to as furnishing an alternative or concurrent explanation of the same harmonious relations between organism and environment. Such, however, as will be seen later, is not the case.

Nothing could be better than the impartial and judicial spirit of the opening pages, in which the author moves methodically on from point to point, clearing the ground of misconceptions, and disposing conclusively of a long series of well-known but futile objections to the theory of natural selection. Presently he takes in hand the case of the superior oblique muscle of the orbit, and shows admirably how the difficulties disappear on reference to the facts of comparative anatomy. But at this point he lets fall an *obiter dictum* which, in view of his opening declaration, is somewhat startling. The development of a muscle-tendon, he thinks, may be explained as the consequence of a pull exercised in a certain direction through many generations. We are thus confronted with a re-entry of Lamarckism; and, reading on, we find abundant proof that Plate, so far from really holding that the phenomena of adaptation are only to be explained by selection, thinks it necessary to supplement that principle by the hereditary transmission of acquired characters. Thus the parachute-like membranes of the flying squirrels, *Galeopithecus*, flying lizards, and the like, are considered by him to have originated from a stimulus exercised by the outstretched limbs upon the skin of the sides of the body, the effects of which accumulated for many generations (p. 31). The ischial callosities of monkeys were produced by the sitting posture (p. 36). The loss of hair and development of blubber in the whales may be due to the direct action of water on the skin and subcutaneous connective tissue (pp. 111, 142). In short, the author leaves us no room to doubt that he believes in use-inheritance, and in the possibility of the transmission of characters however acquired.

On turning to the grounds for his belief, we find them stated as follows (p. 55):—(1) All or almost all of the somatic cells may be supposed to contain germ-plasm; this is made probable by the phenomena of regeneration. Moreover, the whole of the germ-plasm, whether of the somatic or genital cells, may be conceived of as forming a network whose nodes are situated in the nuclei of the different cells. A peripherally-started impulse would be propagated along such a network in all directions, and in this way a somatogenic character might become transmissible by descent. (2) Use-inheritance forms the simplest explanation of co-adaptation. (3) Many phenomena can only be understood by reference to orthogenesis, *i.e.*, the cumulative effect of a stimulus acting through many generations. (4) The gradual dwindling of rudimentary (vestigial) organs must be accounted for by inheritance of the effects of disuse.

Of these, the first is mainly speculative; moreover, were the initial assumptions granted, it would still be far from clearing up the actual mode of the supposed transmission. Two of the others have no doubt been felt as difficulties by some of the upholders of natural selection, and have already been pressed home by Herbert Spencer; but there are other ways of accounting for these and similar phenomena which seem more satisfactory than the recourse to Lamarckians' explanations. Plate very candidly admits that there is at present no direct proof of the transmission of acquired characters, and it is unfortunate that he burdens his argument for selection with the unnecessary weight of an unproved and improbable hypothesis. His real reason for declining to rank himself with the anti-Lamarckian is probably the difficulty that he finds, in common with many others, in assigning selection-value to the early stages of variation. But, as Wallace and others have shown, when the actual variations come to be fairly examined, it appears that ample material for selection exists from the outset. It is worthy of note that Plate himself, in discussing Cunningham's strictures on Weldon's experiments with crabs, admits that the latter has virtually shown the selection-value of slight differences of structure.

A large portion of the treatise is devoted to the subject of sexual selection. An excellent classification of secondary sexual characters is given, and the whole question is treated on broad and generally rational lines. It is to be regretted, however, that the author, in emphasising the slenderness of the evidence for female choice that at present exists, has failed to do justice to the statements of some opponents. An instance of this occurs in the case of an observation of Poulton's, whom Plate represents as having watched the female of such a moth as *Saturnia carpini* resting motionless amidst a crowd of fluttering males, all of them most eager to pair, but unable to do so until the female, in some way imperceptible to the observer, made her choice. Poulton's interpretation of the facts is somewhat curtly rejected, and the subject is dismissed. A reference, however, to the original account will show that the argument is inaccurately given. The moth specified is not *Saturnia carpini* or one of its allies, but the widely removed *Charaeas graminis*. On the other hand, Poulton expressly says that the female of *Saturnia carpini* "in its present condition is certainly passive, and probably always accepts the attention of the first male to arrive." The slip would matter little were it not that it has the effect of obscuring Poulton's argument, which rests on the observed facts that the females of some moths

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(as *Saturnia carpini* and *Orgyia antiqua*) accept the first male that arrives, while those of others (as *Charaeas graminis*) allow a period of competitive courtship ; and, further, that as a rule moths with bright colours belong—or at a former period did belong—to the latter group rather than to the former.

Plate's own view as to female choice is that it is exercised only as between pairing and not pairing. There is, he thinks, plenty of evidence as to success or failure of incitements employed by the male, but little or none of choice by the female between individual suitors. The distinction seems rather delicate. A would-be pairer may fail from want of sufficient power to charm the female ; but rejection implies choice, and if competitive incitement *does* take place, as Plate seems to allow, whether simultaneously or successively, how does this differ from sexual selection in Darwin's sense?

On the subject of "sports," the author is no doubt right in contending that they have little or no bearing on the question of species-formation. But before unreservedly asserting that they must tend to be swamped by intercrossing with the parent species, he would have done well to examine the evidence brought forward by Standfuss and others in support of the position that the crossing of an aberration with the parent form may often result, not in the production of intermediate types, but in the sharp cleavage of the offspring into two groups, each resembling one of the parents and not the other. If these observations and experiments are to be relied on, they imply the theoretical possibility of a sport, supposing it to be selected, eventually displacing the parent form ; and, indeed, there is little doubt that under domestication something very much like this has actually occurred.

The treatment of adaptation is in many respects excellent. Kallima, the well-known Indian genus of leaf-like butterflies, is once more brought to the front and used as a conclusive instance of selection, furnishing also a good *reductio ad absurdum* of the "photographic" theory. But the author introduces a needless confusion by his method of handling the subject of "direct" and "indirect" adaptation. The former, he says, is repudiated by the "School of so-called Neo-Darwinians," of whom he specifies Weismann, Wallace and Spengel. It is certainly repudiated by them in the sense that they see no evidence for the "transmission of modifications due to individual plasticity," to use Lloyd Morgan's expression. But a distinction much more in accordance with the facts is that between "variable" and "invariable" adaptations. In the former are included such cases of individual assimilation in colour to surrounding conditions as have been principally made known, in the instance of caterpillars and chrysalises, by the labours of a "Neo-Darwinian." These adaptations are apparently "direct" in the sense that they mark a reaction of the individual to its own environment, but not in the sense that they are in any way actually produced by that environment. In common with all other cases of adaptation, whether variable or invariable, they are ultimately the result of a process of selection. The sensitive species is selected, not because it is green or because it is brown, but because in response to the appropriate conditions it is capable of becoming either one or the other. Plate's inclusion of Haeckel, Lloyd Morgan, Osborn and Henslow in the same category of believers in "direct adaptation," together with his criticism of Baldwin on an earlier page, serves to show that he has imperfectly grasped the point at issue. What we hold to be the true doctrine has been excellently expressed by Spengel in a passage quoted by Plate with disapproval (p. 141).

Though we have felt bound to express dissent on many points, we must not be taken as undervaluing Plate's labours. On the contrary, we have formed a high opinion of his knowledge, industry and argumentative power. As a champion of the indispensability of natural selection he has done excellent service, and it is only to be regretted that in adopting this illuminating principle he has failed to set himself free from the bonds of what seems to us a fanciful and unnecessary adjunct. F. A. D.

A TEXT-BOOK OF ELECTRICITY.

Deschanel's Natural Philosophy. III. *Electricity.* By J. D. Everett. Pp. xii + 358. (London: Blackie and Son, Ltd., 1901.)

PROF. EVERETT'S "Deschanel" is too well known to need commendation, and the new edition which is now before us has the many merits of its predecessors. The account it gives of fundamental electrical phenomena is admirable, the descriptions of apparatus are clear and good, though at times slightly too concise, the printing is well arranged and accurate, and the illustrations are excellent. In places, it is true, we recognise old friends which have done duty somewhat too often.

At the same time, the task just now of writing a really satisfactory text-book of electricity is a most difficult one, and Prof. Everett's success is not complete.

"The work," he says in his preface, "is in the main new. Electrical theory has been revolutionised during the past few years ; and great need exists for a text-book which shall present the subject in its present shape as a clear and connected whole without demanding on the part of the reader an exceptional amount of mathematical knowledge. This is the want which I have endeavoured to supply."

"The work is *in the main* new." Prof. Everett has hampered himself in his attempt to give a modern theory of electricity by retaining even that part of the old which he has kept ; the result is somewhat of a patchwork. Thus, Maxwell's conceptions with regard to electric action in dielectrics are introduced as "a new chapter in electrostatics." What was wanted was not an additional chapter in an old book, but an elementary account of the fundamental phenomena of electrostatics, given in the language of Maxwell's theory.

The book commences with electrostatics, and of necessity the language used at first is that of the theory of action at a distance. A charged body attracts light bodies and repels other bodies similarly charged ; the action of a gold leaf electroscope depends on the repulsion between the like charges of the leaves ; the electrophorus is described as a means of obtaining electricity in small quantities, but no explanation is given in §30 of its action.

The idea of electric potential is introduced in chapter vi., the first of the chapters in large type. These, it is

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